ENERGY STAR Connected Thermostats

Stakeholder Working Meeting
Field Savings Metric

March 11, 2016

Agenda

- Software status
  - Quick fix
  - Next major revision April
- Developing hourly and daily data
- What kind of standard error of the mean could we require?

Attendees

Abigail Daken, EPA

Doug Frazee, ICF International, for EPA

Jennifer Kulp, ICF International, for EPA

Dan Baldewicz, ICF International, for EPA

Alan Meier, Lawrence Berkeley National Laboratories

Ethan Goldman, VEIC

Nick Lange, VEIC

Michael Blasnik, Nest Labs

Dave Cassano, Nest Labs

Raj Shah, Carrier

Paul Kiningham, Carrier

Phil Ngo, Impact Labs

Brent Huchuck, Ecobee

Wade Ferkey, AprilAire

Jack Callahan, BPA

Michael Siemann, Weatherbug Home

Wendell Miyaji, Comverge

Laurie Sobczak, Comverge

Alex Bosenberg, NEMA

Matt Golden, Open EE

Ed Pike, Energy Solutions, for CA IOUs

Ford Garberson, Ecofactor

Ram Soma, Ecofactor

Chris Smith, IRCO (Trane)

Roy Crawford, IRCO (Trane)

Kurt Mease, Lux Products

John Sartain, Emerson

Charles Kim, SoCalEdison

Henry Liu, PG&E

Software status

- Proposed “quick fix” – protect statistics module from NaN, ±inf
  - In testing
  - Will contact data submitters next week with a request to resubmit
  - A few specific questions:
    - Does distribution of metric scores, now that we’ve eliminated worst results, look at all Gaussian, at least in climates where we expect reasonable results?
    - What does the distribution of either the intercept (for the linear model) or the base ΔT (for the CDD/HDD models) look like?

Software status – next round of updates

- expected to be complete in April
- Ongoing BugFixes
- Thermostat modules
  - No splitting into “seasons”: module to output one set each of heating savings and cooling savings
  - Interpolation in the case of 1-hour of missing temp. data
  - Output cumulative heating & cooling run time
  - Run time **input** changed to minutes (from seconds)
  - Include units for output data file
  - Goodness of fit: RMSE, relative RMSE, MAPE, MAE

Software status – next round of updates

- Statistics modules
  - Do not use thermostats:
    - with > 5% of days with missing runtime data
    - that fail data validity rules
    - with poor goodness of fit
    - With ΔT base outside of the -10 to 50°F range
  - Output weighted national average based on ZIP code groups
  - Include units for output data file

Software status discussion

- Re weird data:
  - There is at least one data set with negative average cooling savings (in the Cold zone) with every method
- Please keep an eye out for such strange results when you re-run data with the new software

Developing hourly & daily data

- Discussion of data validity rules made clear that some would need to be applied by vendors in preparing data
  - For instance, if two consecutive hours of indoor temperature data are missing
  - Is specification of these data validity rules in the sample selection section of the Method to Demonstrate Savings sufficient? Is there anything else we could do?

Developing hourly/daily data discussion

- Anyone feel that the level of control we now have is wildly inadequate?
  - No one speaks up
- Specific suggestions of other reasonable measures?
  - No one speaks up
- How big a concern is this/what % population would this affect?
  - Generally, days missing a little data are missing a lot of data
  - Would be good to track how much data we are loosing as we run the new software – be aware of different impacts in different climates

What level of standard error of the mean?

- We had talked about having a maximum standard error of the mean for submitted data, rather than having a defined sample size
- Even with the very strange results, the submitted data (on those data sets and climates where the results were relatively sensible) had standard errors in the 1% - 3% range.
  - This is not a percentage error, but an absolute error of a percentage result, e.g. HS = 9% ± 1%
  - Is asking for 0.5% error reasonable, once we have some data validity rules in place, like the goodness of fit requirement?

Discussion: standard error of the mean level

- Could also ask that data be above the requirement with a given level of certainty.
  - Possible – will need to discuss with management
- If requiring this on a regional level, vendors may have a hard time in the Marine climate, where a relatively large proportion of homes have poor fit to this model
- Will savings requirement be regional?
  - Don't know yet – haven't ruled out the requirement of regional requirements
  - Might make sense to see how a given selection of error plays out regionally in terms of consumer value
  - In cold region, a requirement on cooling savings may be difficult to meet
  - Hard to evaluate reasonableness of error requirement without knowing what the levels are

Discussion: standard error of the mean level

- Huge outliers effecting standard errors currently – one vendor cut highest and lowest 1% of savings scores out of statistical sample, standard errors reduced by order of magnitude

FYI: ACEEE Summer Study Paper

- EPA has submitted, and had accepted, a paper on this method and metric, to the 2016 ACEEE Summer Study on Energy Efficiency in buildings
- Draft due next week; final in May; presentation in August

Contact Information

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